Claims

1. A process for polymerizing one or more alpha-olefins comprising the following steps:
   a) contacting in a continuous way one or more of said alpha-olefins with a metallocene-based catalyst system in a loop reactor, wherein:
      (i) the reaction is carried out in a liquid medium;
      (ii) the average residence time of the metallocene-based catalyst system is not more than 30 minutes;
      (iii) the temperature ranges from 25° to 70°C;

   in order to obtain a polymerization degree ranging from 60 to 500 g per gram of catalyst system;
   b) feeding in continuous the prepolymerized metallocene-based catalyst system obtained in step a) into a polymerization reactor;
   c) polymerizing one or more alpha-olefins, the same or different from the alpha-olefins used in step a), in the presence of said prepolymerized metallocene-based catalyst system.
2. The process according to claim 1 wherein the prepolymerization step a) is carried out in the presence of hydrogen.
3. The process according to claim 2 wherein the prepolymerization step a) the amount of hydrogen present in the loop reactor preferably ranges from 5 to 1000 ppm.
4. The process according to anyone of claims 1-3 wherein the average residence time in step a) is not more than 20 minutes.
5. The process according to anyone of claims 1-4 wherein in step a) the polymerization degree of the prepolymerized metallocene-based catalyst system ranges from 70 to 300 g per gram of catalyst system.
6. The process according to anyone of claims 1-5 wherein in step a) the temperature ranges from 30°C to 65°C ;
7. The process according to anyone of claims 1-6 wherein the metallocene-based catalyst system is obtainable by contacting:
   a) at least a transition metal compound containing at least one π bond;
   b) at least an alumoxane or a compound able to form an alkylmetallocene cation; and
   c) optionally an organo aluminum compound.

8. The process according to claim 7 wherein the metallocene-based catalyst system is supported on an inert carrier.
9. The process according to anyone of claims 1 to 8 wherein step a) of the process is carried out in the loop reactor (1), then the catalyst-prepolymer product is transferred to separator (2) via line (C), and then via line D to the gas-phase reactor (3) and the polymer is withdrawn through line (F).
10. The process according to anyone of claims 1 to 8 wherein step a) of the process is carried out in the loop reactor (1), then the catalyst-prepolymer product is transferred via line (C), to the gas-phase reactor (2) and the polymer is withdrawn through line (D).
11. The process according to anyone of claims 1 to 8 wherein step a) of the process is carried out in the loop reactor (1), the catalyst-prepolymer product is transferred to the loop polymerization reactor (2) via line (C) and the polymer is withdrawn through line (E).
12. The process according to anyone of claims 1 to 8 wherein step c) is carried out in one or more reactor connected in series.
13. The process according to anyone of claims 1 to 12 wherein one or more alpha-olefins of formula CH_2=CHT wherein T is a hydrogen atom or a C_1-C_{20} alkyl radical and optionally polyenes are homopolymerized or copolymerized.
14. The process according to claim 13 wherein propylene is homopolymerized.
15. The process according to claim 13 wherein propylene is copolymerized with ethylene or with one or mere alpha olefins of formula CH_2=CHT^1 wherein T^1 is a C_2-C_{20} alkyl radical and optionally with polyenes.
16. The process according to claim 15 wherein propylene and ethylene are copolymerized.